Renovation of Annual Grassland in Japan by Volunteer Grasses

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Renovation of annual grassland in Japan by volunteer grasses

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Key words: digitaria adscendens, dormancy, Echinochloa crus-galli, germination, Lolium multiflorum

Introduction Temperate perennial grasses from Europe, such as *Dactylis glomerata* L. and *Festuca arundinacea* Schreb., are the main grasses sown in meadows of Japan. However, since the Kyushu Region in southwestern Japan is warmer, tropical annual grasses such as *Echinochloa crus-galli* (L.) Beauv. and *Digitaria adscendens* (H.B.K.) Henr. have spread in meadows from summer to autumn. Meanwhile, volunteer *Lolium multiflorum* Lam., which is a temperate annual grass, spreads from spring to early summer in meadows of the Kyushu Region. In this way, tropical and temperate annual grasses alternate in dominance as volunteer grasses. We investigated the seasonal change of vegetation in an annual meadow and the characteristics of germination and dormancy for *Echinochloa crus-galli*, *Digitaria adscendens* and *Lolium multiflorum*.

Materials and methods In 2002 we investigated a meadow in the Kyushu Region (33°03′ N, 131°13′ E) where annual grasses alternated in their dominance. The meadow was mowed twice during the investigation period. We regularly measured the cover and plant height of all species at five points in the meadow by using 1-m^2 quadrats. MDR (Multiplied Dominance Ratio) was calculated from those values (cover* height). Furthermore, seeds of *Echinochloa crus-galli*, *Digitaria adscendens* and *Lolium multiflorum* were placed in nylon mesh bags and buried in the meadow ground immediately after shattering. Those seeds were dug up regularly, and germination tests were conducted under various environmental conditions.

Results Volunteer *Lolium multiflorum* dominated from spring to summer. After summer cutting, tropical annual grass such as *Echinochloa crus-galli* and *Digitaria adscendens* dominated as volunteer *Lolium multiflorum* declined (Figures. 1, 2). Light and alternating temperatures induced the germination of *Echinochloa crus-galli* and *Digitaria adscendens*. But the effect of light and alternating temperature differed greatly for different stages of dormancy (Figures. 3, 4). Volunteer *Lolium multiflorum* also had dormancy and light germination, but its dormant period was only one month from shattering (Figure. 5).

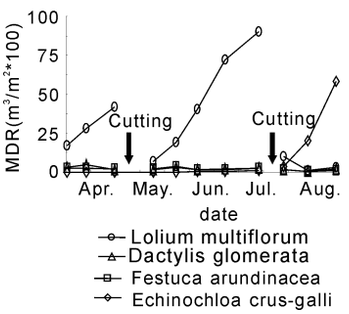

Figure 1 *Seasonal change of MDR in* Echinochloa crus-galli *population. Arrows indicate cuttings.*

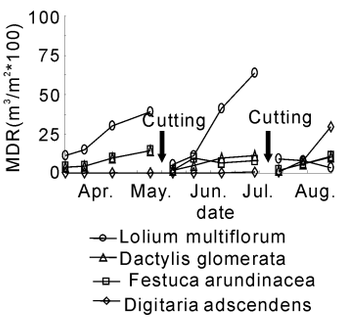

Figure 2 *Seasonal change of MDR in* Digitaria adscendens *population. Arrows indicate cuttings.*

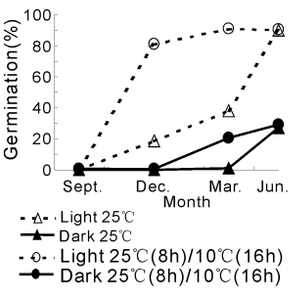

Figure 3 *Germination of* Echinochloa crus-galli *in different dormancy awakening stages. Seeds were incubated for 14 days.*

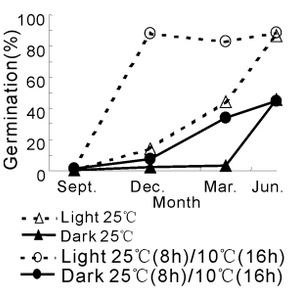

Figure 4 *Germination of* Digitaria adscendens *in different dormancy awakening stages. Seeds were incubated for 14 days.*

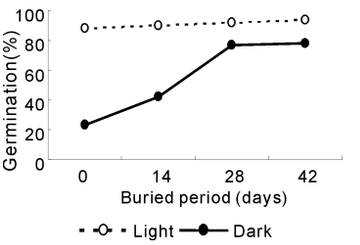

Figure 5 *Germination of volunteer* Lolium multiflorum *in different dormancy awakening stages. Seeds weer incubated under 25℃ light for 14 days.*

Conclusions *Echinochloa crus-galli*, *Digitaria adscendens* and *Lolium multiflorum* were able to sense the safe period and safe site for subsequent growth. Properties of germination might be a major factor that explains the survival and alternate dominance of these annual grass populations in the meadow.